extent, in New York in 1866. It prevailed, as stated by the Sanitary Superintendent, Dr. Edward B. Dalton, at first "in localities widely separated, but as the season advanced and the cases became more frequent, they occurred, not successively in the same localities, but, with comparatively few exceptions, within the limits of various circumscribed localities, which latter were themselves widely separate from each other, the result being, that individual cases were proximate, while the groups were widely separated." The Board of Health wisely determined to resort to efficient measures of disinfection, with the hope of destroying the special cause without assuming anything as to its nature, or whether in its origin it be intrinsic or extrinsic. Every house in which a case of cholera occurred was promptly disinfected. It is not certain that these efficient measures were the means of restricting the prevalence of the epidemic, but there is much reason for conjecturing that they accomplished this result. Certain it is, that the water supply had nothing to do with the existence of the epidemic, and that this epidemic exemplified the facts which go to show that the disease is not communicable.

Finally, Dr. Farr's Report, with the appendix, is an elaborate and exhaustive exposition of the evidence to be adduced in support of the diffusion of cholera by means of water supplies; and, if we do not err, its value, in this point of view, consists in the conclusion that this explanation of the causation of the disease is unsatisfactory. A. F.

ART. XXIII.—*Kidney Diseases, Urinary Deposits, and Calculous Disorders; their Nature and Treatment.* Containing Seventy Plates and Tables for the Clinical Examination of Urine. By LIONEL S. BEALE, M.B., F.R.S., F.R.C.P.; Physician to King's College Hospital; Professor of Physiology and General and Morbid Anatomy in, and Honorary Fellow of, King's College, London. Third Edition, much enlarged. 8vo. pp. 472. Philadelphia: Lindsay and Blakiston, 1869.

THIS is a very elaborate treatise. The author has, in all parts, proceeded upon the principle that no scientific scrutiny and investigation, however minute, can be really unnecessary or impracticable, and that such work must ultimately lead to great results in improved therapeutic methods. In the chemical and analytical sections Dr. Beale has had the important aid of Professor Bloxam and Mr. Sutton, and every process of examination which has stood the test of experience up to the present time, is stated in a concise and available form. The clinical remarks and observations on the treatment of urinary diseases have been very much extended, and the chapter on surgical operations derives increased certainty and value from the revision of Mr. John Wood. Many of the alterations and additions to the text have to do with the author's recent laborious researches, and contain such conclusions as naturally follow from the application of his now well-known views upon minute anatomy and pathology to the affections of special organs. The usefulness of the book has been increased by nearly one hundred new drawings, and as many more have been re-engraved in order to render them more truthful representations of nature. As in other editions, scales have been appended to the illustrations, by the aid of which every object represented can be accurately measured without difficulty. The occasional repetition of plates published elsewhere may well be permitted to a writer who has so patiently persevered in accumulating faithful delineations of actual appearances and in rigidly excluding all diagramatic illustrations in matters of fact. They who complain of a dogmatic tone in some of his descriptions might properly reserve their judgment until they have produced copies of equal merit from preparations of the same healthy and diseased tissues; and the expressions too positive for the approval of exact science, into which he is now and then betrayed while evolving some favourite theory, are, perhaps, fewer than similar ones in the writings of those who differ from him.

Part I. is devoted to the consideration of 1st, the Anatomy and physiology of the kidney; 2d. Its structural changes; and 3d. The treatment of its diseases. From the outset the position is strongly maintained, that the kidney is not a mere filter only, but also an apparatus in which the oxidation of certain matters about to be got rid of, is effected, and imperfectly soluble substances are converted into readily soluble and highly diffusible compounds. The views of Bowman in relation to the Malpighian bodies and their connections are adhered to, and the objections to these views are shown to be founded on error chiefly due to faulty methods of preparing specimens for examination. The idea originally promulgated by Henle—and which, too hastily supported by other writers, has caused so much unnecessary discussion—of there being two distinct systems of tubes in the kidney, the one open and the other closed, is entirely rejected, and appears to have no other basis than the familiar fact that many of the convoluted tubes dip down for some distance among the straight tubes of the pyramids, forming loops, the convexities of which are directed toward the apex of the pyramid.

Dr. Beale's observations on the epithelium of the renal tubules bear directly upon his explanation of the secreting function. He has never seen the outline of the secreting cells so distinctly as it is usually figured in anatomical works, or, indeed, in his own figure. He is compelled to dissent from the descriptions generally given, both of the kidney and liver epithelium, inasmuch as the appearance of a cell wall can only be seen under certain circumstances; and in the normal cell there is undoubtedly no such structure. Spherical masses of germinal matter ("nuclei") are imbedded in a granular ("formed") material which they have produced, and by which they are separated from each other at nearly equal distances. The fluid which exudes from the Malpighian tufts (these being *devoid of epithelium*) passes down the tube, holding in solution some substances *separated* from the blood, but particularly a *large amount of oxygen*, and bathes in its progress the surface of the formed material. From the blood of the intertubular network the germinal matter takes up certain excrementitious constituents, and thus new germinal matter is formed. But the mass does not increase in size, because, at the same time, a portion of the germinal matter already produced undergoes conversion into formed material; nor does this latter accumulate because it is being constantly disintegrated by the action of water and oxygen, and resolved into urinary elements.

This view requires only a change of phraseology when we speak of desquamative nephritis, but it enables us better to understand the essential processes of that morbid condition. If each "nucleus" is not simply the comparatively inert centre of a "cell" whose sole office is to *filter* effete material from the blood, but germinal matter in a state of great activity, which constructs the substance around it from its pabulum, *i. e.*, the excrementitious matters in the circulation, presenting these in an altered form capable of being oxidized by the oxygen of the tubule-fluid, then the rapid multiplication of this germinal matter, and the excessive enlargement of this formed material when the blood contains a correspondingly abnormal amount of the pabulum, become much more intelligible. It gives us too a clearer explanation of the formation of casts and the production of albumen. It is doubtful whether the escape of albumen, and its presence in the urine is in all cases to be attributed merely to increased pressure upon the capillary walls and the transudation of serum. The albumen of urine often differs chemically from that of blood. May not albumen of a particular kind be actually *formed* in the kidney, just as mucus is *formed* upon the surface of mucous membranes by the agency of masses of germinal matter which are situated there? This *formative* function, attributed by Dr. Beale to the kidneys in a former edition of his work, and now specially insisted upon, has been almost demonstrated by the experiments of Oppler, Perls, and Zalesky. If the renal vein be tied, more urea is found in the blood than if the kidneys be removed. Perls has proved that no urea is to be detected in the tissues of animals if the kidneys are extirpated; but, on the other hand, if the ureters be tied, the accumulation is very considerable. The observations of Zalesky on serpents are still more to the point. When the kidneys were removed no uric acid or urates could be detected in any part of the body, although the animals lived three weeks; while, if the ureters were tied, every tissue contained urates in large quantity. Traces of urea, uric acid, and other special urinary constituents may be found in the blood, but *by far the largest proportion is produced in the kidneys themselves.* This harmonizes with the established fact that in many cases of severe "uræmia" no urea is to be detected in the blood; and, also, with the generally received opinion that this peculiar toxæmic state results from the accumulation of very many substances connected with destructive assimilation. When a large quantity of urea is found in the blood the formation of this substance has probably been going on actively in the kidney and has been followed by reabsorption.

Dr. Beale's delicate microscopic dissections have thrown much light on the distribution of nerves to the renal vessels and secreting structure. By observations upon the kidney of the newt, and of the mammal in various stages of its development, he has demonstrated the supply of nerve fibres to the convoluted portions of the uriniferous tubes, to the intertubular capillaries, and to the capillaries of the Malpighian bodies; also in great numbers to the minute arteries and veins; and in the arteries he has detected the unstriped muscular cells up to the points where they enter the Malpighian tufts. These nerve fibres are all connected with ganglia cells, from each of which two or more fine fibres proceed in different directions, establishing connection between the cells of these and other ganglia and peripheral parts. When the filaments reach the wall of a uriniferous tubule they divide and subdivide freely, giving off still finer branches which ramify in the connective tissue entering into the so-called "basement membrane."

The ganglia above referred to are without doubt special nerve ganglia of the kidney, and bear the same relation to this organ that the little ganglia of the cardiac nerves bear to the heart. Dr. Beale regards the fibres distributed to the walls of the uriniferous tubes as constituting an afferent system precisely corresponding to that which he has described in other tissues, and capable of influencing through the nerve centre the efferent fibres distributed to the arteries.

Thus they govern the calibre of the arteries, and necessarily regulate the proportion of blood flowing through the capillary vessels. The ganglia within the kidney are also connected with ganglia external to the organ, as well as with spinal nerve fibres, which probably connect the renal nerves and ganglia with the great nerve centres.

The author suggests that we may perhaps explain in this way the influence exerted by emotion upon the secretion of urine. Currents which usually cause a certain amount of contraction of the muscular fibre cells of the artery may be supposed to be neutralized or diverted. Dilatation of the vessel occurs. A rush of blood is suddenly determined to the Malpighian capillaries, and an abundant flow of watery urine immediately follows. These careful anatomical researches must necessarily lead to important conclusions with reference to renal phenomena both normal and abnormal. Seeing in them the germ of much more accurate knowledge we the more regret that Dr. Beale has so decidedly adopted the view that the sole function of this nervous apparatus is to regulate the circulation of the arterioles and capillaries. He assumes that the filaments which ramify upon the tubules are *afferent* (vaso-sensory) merely, and refuses to believe that they can take part in influencing the secretory process except indirectly as portions of the reflex vaso-motor circles. This limitation is founded upon the failure as yet to detect the passage of any filaments to the cells themselves.

We find a record of investigations into the minute vascular system of the kidney, which clears up a disputed point and exhibits the existence of a *collateral circulation* of great importance in certain diseased conditions. Most of the blood entering by the renal artery passes in health directly to the Malpighian tufts, thence through the emerging vessel and the intertubular network to the converging branches of the emulgent vein. Of the comparatively small quantity which passes *inwards* toward the apices of the pyramids, the greater portion flows into the *vasa recta.* These, which have been injected by Arnold, Hyrtl, Leydig, Virchow, and Beale, terminate in a capillary network in the longitudinal meshes of which the straight portions of the tubes lie. Some of these straight vessels, however, are divisions of those which emerge from the tufts lying near the bases of the pyramids. This arrangement was fully described by Bowman in his memoir; but he thought that *all* the straight vessels in the pyramids came from the Malpighian bodies. Virchow, on the other hand, seems to have concluded that all or nearly all consist of *vasa recta,* while Barres and Kölliker have failed to find them altogether. Both varieties undoubtedly exist in considerable number, and in cases where the cortical circulation is impeded we have a collateral channel by which the blood, still propelled through the main renal artery, returns to the vein without passing through the tufts. Accordingly we find under such circumstances that the *vasa recta* are enlarged and thickened.

The anatomical views of the author most directly bearing upon renal pathology are those concerning the so-called "matrix." This, described and delineated by Goodsir, Kölliker, and Dr. George Johnson as a distinctly fibrous supporting framework, in the meshes of which tubes and vessels ramify, he has not succeeded in demonstrating. All that can be proved to exist in a young healthy kidney is a very small amount of perfectly transparent tissue, which connects together the tubes and vessels. It is argued that the structures do not need any supporting tissue, as they mutually support each other; and any matrix would tend to increase the distance between the secreting cells and the blood, and so render the gland less perfect and less fitted for the performance of its function. In reality, every arrangement consistent with strength is adopted to diminish this distance. Moreover, the matrix ought to be developed as a distinct structure; but in a careful examination of embryonic kidneys we cannot fail to be struck by the absence of such fibrous or connective tissue. It is at this early period that the tissues are softest and most in need of support; yet they are peculiarly destitute of any such framework. The conclusions finally reached are stated as follows:—

1. "In the cortical portion of the kidney there is no evidence of the existence of a 'fibro-cellular matrix' distinct from the walls of the tubes and capillaries."

2. "The fibrous appearance observed in thin sections of the kidney which have been immersed in water is fallacious, and is due to a crumpled, creased, and collapsed state of the membranous walls of the secreting tubes and capillary vessels."

3. A small quantity of transparent material is to be demonstrated between the walls of the tubes and the capillary vessels in health; and not even this can be detected at an early period of development.

Virchow and his followers, as is well known, assign extreme importance to "connective tissue," regarding it not only as an essential part of every organ—a necessary foundation upon which the other textures are raised as a superstructure—but holding that it is concerned by its corpuscles and supposed tube system in the distribution of nutrient matter to other and higher tissues.

"Some members of the Dorpat school have given it, if possible, a still higher significance," and have regarded it as a principal element of the highly organized cerebro-spinal system.

Dr. Beale, dissenting from these authorities upon the general question of the functions of connective tissue, and taking issue with them as to its existence, even, in the special instance of the renal structure, diverges yet more widely from their views when he comes to consider the organic changes of the kidney in disease. He holds that, in the contraction and wasting which affect glandular organs (cirrhosis), the connective tissue is passive, and that what has been so termed, in sections of contracted and other kidneys, is really composed chiefly of altered vessels and wasted secreting structure; the epithelial and vascular elements having been concerned in changes which would assuredly end in total destruction of the organ were their progress not arrested by the patient's death. In considering the various forms of chronic Bright's disease, the author rejects as unsatisfactory the division into *tubal*, *intertubal*, and *vascular*, because it is to him "quite certain that the intertubular connective tissue is not the seat of origin of any form of renal disease, while it is at least most doubtful if the vessels can in any case be regarded as the starting point of morbid actions." He then proceeds to describe certain pathological conditions, which may occur independently of each other, or coexist in various degrees of development. These are *contraction and wasting of the kidney; enlargement; fatty enlargement; fatty contracting kidney;* and *the so-called amyloid, waxy, or albuminous degeneration.* Dr. Dickinson, in his late valuable work on *Albuminuria*, strongly maintains the usual view concerning the series of processes resulting in the "granular kidney." Dr. Beale, on the contrary, concludes that those forms of disease which are supposed to result from hypertrophy or inflammation of the matrix are due to neither hypertrophy nor inflammation of any kind whatever. The secreting tubes shrivel and waste, and leave a residue of condensed "connective tissue." The cause of this change is to be sought for in connection with the cells themselves. An organ which is made to take upon itself an undue amount of work, at first undergoes considerable and rapid increase in size. The relation of the structures to each other becomes altered, and action seriously deranged. Then wasting of the whole commences, and continues so long as life lasts. We believe that the profession will decline to accept either of these doctrines to the exclusion of the other; or, indeed, to declare any final judgment at the present time.

Increased size of the kidney is referred, 1, to vascular distension; 2, to multiplication of cells in the uriniferous tubes; and 3, to the formation and growth of new (extra vascular) material. The production of all material outside of the capillaries is regarded as due to particles of germinal matter, which have passed through the vascular walls, and in no instance to the connective tissue corpuscles. This passage of germinal matter occurs most frequently in cases of chronically altered blood, long recognized as a potent cause of Bright's disease. The kidney described as "*large, white fatty,*" with stellate veins upon the surface, is in no way related to other forms of renal disease. It *may* become smaller, but does not *necessarily* precede chronic wasting.

One of the most serious forms of structural alteration is the *fatty contracting* kidney, where the formation of new texture, the deposition of fatty matter, and the shrinking and wasting of the gland tissue are proceeding at the same time. The occurrence of these various changes renders this condition very difficult to investigate. Tubes distended and conspicuously enlarged lie side by side with those which are very narrow and shrivelled. These latter, with the intertubular capillaries, are often obscure, and are described as "indefinite granular matter." In the accompanying plate they are here distinctly delineated.

The account given by Dr. Beale of "*albuminoid*" degeneration does not throw any additional light upon the subject, and seems to us to contain a very imperfect recognition of the investigations of Dr. Dickinson. Indeed it is scarcely just to omit all reference to the sulphate of indigo test. More to be commended is the exception taken to the "depurative" theory. "If this is true, there ought, one would think, to be some quantitative relation between the purulent discharge and the development of the amyloid; but in some cases of waxy liver, where the organ weighed eight or ten pounds, no history of purulent discharge was obtained," and to attribute the disease under such circumstances to albuminuria does not in any way strengthen the position. On the other hand, long-continued purulent discharge frequently occurs without any amyloid "residuum" being discovered. We agree in the conclusion that "the waxy disease, the purulent discharge, the disease of bone, and tubercle where it exists," are the results of a common cause and not consequences one of another.

This section contains full accounts of other structural changes of the kidney, as also of the symptoms and treatment of renal diseases; but we pass over these, desiring only to call attention to the completeness of the work, and to dwell upon the most important of the author's peculiar views.

Part II. (p. 90 to p. 174) treats with very great detail, care, and clearness of *Healthy Urine* and *its examination* by chemical and microscopical tests, with descriptions of necessary apparatus; enlarges upon its *general characters* and *constituents;* and gives a very satisfactory series of directions for *volumetric analysis.* This last section was prepared by Mr. Sutton, and while less extended than that in the work of Neubauer and Vogel is eminently practical. We think the introduction of the "fluid decem" (equal to ten grains of distilled water at 62° Fah.) as a unit of measure, unnecessarily confusing. It is better to adhere uniformly to the cubic centimetre. Dr. Schunck's important researches upon the extractive and coloring matters are stated at length in their appropriate position.

Part III. (p. 174 to p. 281) is devoted to the discussion of *urine in disease,* under the heads of 1. Excess or deficiency of water and the organic constituents. 2. Excess or deficiency of the inorganic constituents. 3. Soluble substances which do not exist in healthy urine. Many highly illustrative cases and accurate analyses are recorded in this connection. We can only select the most important conclusions.

Phosphates in Diseases of the Nervous System.—After detailing at length the observations of Bence Jones, Sutherland, Adamson, and others, extending over a great variety of cases, and combining them with his own, Dr. Beale declares that the evidence so far compels us to conclude that the action of the brain exerts little or no influence upon the secretion of phosphates; while the nature and amount of the food, the weight of the body, and the state of the organism, may produce very considerable variation. While he does not deny that increased nervous action may be associated with the formation of an increased quantity of phosphoric acid, which is eliminated in the urine, he thinks the facts hitherto advanced in favour of this view are by no means conclusive; and he therefore holds that we are not yet in a position to form any theory upon the changes occurring in health or disease, in cerebral action, regarded from this point of view.

The careful modifications of the ordinary processes required to determine the presence or absence of *albumen* in doubtful cases, and the numerous anomalies familiar to those accustomed to manipulate with urinary tests, are appropriately developed. They will be found very useful for reference by those who are surprised on finding a precipitate produced in urine containing no albumen, and no precipitate occurring although albumen is present.

Bile.—We agree entirely with the author in placing a low estimate upon the value of Pettenkofer's test as usually employed, and in discrediting the conclusions reached by Harley and others through its use. Hoppe's modification, no doubt, answers so well as to be much more reliable; and in the hands of Kühne has succeeded in detecting bile acids in almost every case of icteric urine. The question of the clinical significance of bile in the urine is certainly an open one, and its decision waits upon the employment of a certain test and many observations. To maintain with Dr. Harley the easy diagnosis between jaundice "from obstruction" and jaundice "from suppression" is premature, but not more so than to deny, as Dr. Beale does, that icterus is ever due to the latter cause.

Sugar.—In connection with the more familiar processes for the detection of diabetic sugar we find the *Bismuth test* recorded. This has been recently proposed by Böttger, and consists in adding first of all potash and then a small quantity of subnitrate of bismuth; lastly the mixture is boiled. If sugar is present, the oxide is reduced to metallic bismuth, which is precipitated in the form of a black powder. Brücke claims that this test is more delicate than Fehling's, and he finds that the black precipitate is produced to some extent in healthy urine. Since Fehling's test will, when properly employed, detect a fortieth of a grain per cent. of sugar, the greater accuracy of this test can scarcely be a matter of much practical importance; but it is a useful addition to the means of investigation previously known.

Upon the consideration of the production of sugar, Dr. Beale enters at length. He accepts the views of Bernard upon the sugar-forming function of the liver, gives a *résumé* of their confirmation by Thudichum, Harley, and himself, and dissents from the opinion of Pavy and M'Donnell that the conversion of glycogenic matter into sugar is exclusively a *post-mortem* change, and never occurs during life in a healthy state. The opinion may be entertained, but no one has succeeded in demonstrating that it is correct. He then approaches the subject from an anatomical point of view. In opposition to Henle, Handfield Jones, and Frerichs, but supported by many microscopical preparations now in his possession, he maintains that the liver-cells *lie in tubes continuous with the ducts.* These liver-cells consist, as others, of germinal matter and formed material, without cell wall, and they act as analogous elements in other glands. The substances absorbed from the intestinal surfaces do not simply pass between nuclei or cells and undergo change, but they serve as pabulum to certain cells which live upon them and grow. The living particles of these cells at length die, become formed material. In this may be found other kinds of fatty, amyloid, and saccharine matters than those originally absorbed. They are entirely new bodies. From the disintegration of the outer part or formed material of the so-called liver-cells result biliary matters, an albuminous substance like casein, and the amyloid or glycogene. The first named are excreted along the tubes and ducts, the two latter permeate the animal membrane and pass into blood. What then becomes of them is uncertain, but when the normal relation between production and consumption is in any way disturbed diabetes results. "There can be no doubt that certain parts of the nervous system are seriously implicated in all such cases, but whether the nerves exert a direct influence upon the sugar-forming or sugar-destroying processes, or only affect these operations indirectly through their control over the calibre of the arteries, and therefore upon the quantity of blood, is not known;" but there are many facts which favour the latter view, and no one has yet traced a nerve fibre into an epithelial cell. Here, as in the case of the kidneys, we think the author is too hasty and exclusive in his limitation of the mode of nervous action, and that it produces results which cannot be referred to mere alterations in the quantity of blood circulating through the organs. Due attention is given to the clinical importance of sugar in the urine, to its association with other diseases, and to the treatment of the affection; but no particularly novel propositions are advanced.

Part IV., upon *Urinary Deposits, Renal Entozoa, and Urinary Calculi,* contains a full *résumé* of all our knowledge upon these subjects. It is eminently practical, and so systematically arranged and richly illustrated, that notwithstanding the multitude of its details, it everywhere plainly instructs and never bewilders. It contains, however, fewer doctrines which are new, or suitable for presentation in a general review. Extended tables with accurate directions for examination and analysis of urine follow, and appropriately complete a work more valuable in its contents and more attractive in its appearance, than any volume upon the subject heretofore presented to the mass of the profession. E. R.